RCRA FACILITY INVESTIGATION WORK PLAN
ADDENDUM #1

DELPHI CORPORATION
DELPHI ENERGY & CHASSIS SYSTEMS
PLANT 400
1300 NORTH DORT HIGHWAY
FLINT, MICHIGAN

US EPA ID # MID 005 356 647

by

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APPENDIX A - ADDITIONAL FIELD SAMPLING PROCEDURES

I. INTRODUCTION

This work plan is an addendum to the RCRA Facility Investigation (RFI) Work Plan, dated March 2003, prepared by Haley & Aldrich for Delphi Corporation. This work plan addendum defines the scope of work for Field Event #2 for the RCRA Facility Investigation (RFI) being conducted at the Delphi Flint-East Plant 400 site (Figures 1 and 2).

The scope of work has been developed based on an evaluation of data collected during the RFI Field Event #1. Data collected during Field Event #1 were screened using appropriate Michigan Part 201 Generic Cleanup Criteria (Screening Criteria) as described in the *Report on RCRA Facility Investigation, Investigation Data Report No. 1* (Data Report) dated March 28, 2003.

Activities described in this addendum, including field work, surveying, quality assurance, quality control, and laboratory analysis, will be performed in accordance with the RFI Work Plan and Appendix A of this addendum.

II. FIELD EVENT #2

Based on data collected during Field Event #1 and the data screening and evaluation provided in the Field Event #1 Data Report, field activities were identified to collect additional data required to complete the Environmental Indicators CA 725 and the RFI risk assessment. These activities include;

- Perform background soil and groundwater analysis
- Collect supplemental hydrologic and geologic data
- Further delineation or characterization of soil and groundwater
- Location Surveying

Soil sampling will be collected from locations as described below. Soil sampling locations were selected to further characterize AOI soil conditions, or were selected biased towards locations anticipated to represent the maximum contaminant levels at each AOI. Biased sampling, when used during Field Event #2 will follow the guidelines described in the RFI Work Plan.

Unless otherwise specified below, soil boring depths will be to the top of the water table, which is approximately eight to ten feet below ground surface. A minimum of three soil samples will be collected from each boring unless shallow groundwater conditions do not allow collection of the deeper samples. One sample will be collected from 0 to 2 feet bgs; another sample will be collected from 8 to 10 feet bgs; a third sample will be collected directly above the water table; a fourth sample may be collected if contamination is indicated by field screening of samples with a portable PID and/or visual observation. Analytical data from these samples will be evaluated using appropriate risk-based screening criteria.

During the RFI, groundwater samples may be collected from direct-push borings (borehole). These groundwater samples collected from boreholes will be used for screening purposes and to evaluate the potential extent of constituents in groundwater. However, borehole samples, due to the potential for high turbidity, will not typically be used in completing risk analysis required for the EI or RFI Risk Assessment.

Unless otherwise specified below, groundwater samples from monitoring wells will be collected using low-flow sampling methods as described in the March 2003 *Field Sampling Plan* (FSP).

Unless otherwise specified below, monitoring wells will be constructed as described in the FSP. Typical monitoring well construction, unless otherwise specified, uses a 10-foot (when possible) - 2-inch diameter PVC well screen (No. 10 slot size) and a 2-inch diameter PVC riser. Details of the installation procedures are provided in the FSP.

Quality control samples (field duplicates, trip blanks, equipment blanks, MS/MSD samples) for soil and groundwater will be collected as described in the Quality Assurance Program Plan (QAPP).

Details of the Field Event #2 activities are summarized in Table I and described below.

2.1 Background Soil and Groundwater Analysis

Task 1. Supplemental Background Sampling

Several locations were sampled during Field Event #1 for potential use in background soil analysis. Based on review of these data, several locations were conservatively dismissed for use in this analysis due to the presence of low-level anthropogenic constituents. As such, additional soil samples will be collected to provide an adequate data set for background analysis and comparison.

Soil samples will be collected from four additional locations. These locations are described in other tasks below and include;

- MW-4606D (Task 2)
- MW-4608D (Task 2)
- MW-4624D (Task 14)
- MW-4631D (Task 14)

Soil samples will be collected during the installation of these wells as described in the FSP. Soil samples will be submitted to the contract laboratory for TAL Metals analysis.

2.2 Site-wide Hydrogeological Investigation

Task 2. Supplemental Site-wide Monitoring Well Installation

Based on the data collected during Field Event #1, two monitoring wells will be installed to refine the interpretation of groundwater flow direction. Several additional monitoring wells installed as part of activities described below (Section 2.3) will be incorporated into the groundwater elevation monitoring network. The two new monitoring wells will be installed to monitor the second saturated zone, paired with existing monitoring wells MW-4606 and MW-4608 along the south-southwest property boundary (Figure 3).

Task 3. Groundwater Elevation Measurements

Groundwater elevations will be measured as described in the March 2003 FSP. Groundwater measurements will be performed each month from April 2003

through December 2003. These data will be used to evaluate seasonal groundwater flow direction and saturated thickness.

The monitoring wells used for this task include existing monitoring wells and those planned to be installed during Field Event #2. The on-site monitoring wells that will be used during this task are listed in Table II and shown on Figure 3.

Task 4. Supplemental Geologic Characterization of Aquitard

With the exception of the northwest corner of the site, an aquitard layer is present separating the first and second saturated sand zone. This aquitard is not present in the northwest corner of the property. The limits of this aquitard are defined at the site property boundary but uncertainty remains on the extent beneath the northwest corner of the building. Furthermore, there is limited quantitative information on the physical characteristics of this aquitard layer.

Visual observations suggest a gradual change in the aquitard from clay in the southern portion of the site to elastic silt in the northern portion of the site. To quantify this observation, six soil samples from the aquitard layer will be collected, using thin walled sampling devices (Shelby Tubes), and analyzed for triaxial permeability by ASTM Method D5084. The method to obtain the samples is provided in Appendix A. The locations of these samples are shown on Figure 3.

These permeability measurements will be used to estimate potential migration of constituents detected in groundwater samples from the first saturated zone to the second saturated zone.

In addition to the collection of the soil samples indicated above, additional soil samples will be collected for physical characterization (e.g., grain size analysis, bulk density, porosity, hydraulic conductivity) to support the selection of site-specific inputs for vapor intrusion modeling. Visual soil classification will be performed at each location identified in Section 2.3.

2.3 AOI Investigations

Task 5. AOI-08 Former Hard Chrome Plating Line (Building #4082)

Hexavalent chromium was detected above screening criteria in one groundwater grab sample (borehole B-4081) during Field Event #1. Other groundwater samples in the area do not indicate elevated concentrations of chromium. To confirm groundwater concentrations of hexavalent chromium, a monitoring well will be installed adjacent to B-4081 as shown in Figure 4.

This shallow well will be installed into the upper sand and will consist of a 5-foot, 2-inch diameter PVC well screen (No. 10 slot size), and a 2-inch diameter PVC riser. The borehole will be advanced to the aquitard beneath the first saturated zone. The well screen will be installed approximately one foot into the aquitard layer.

The well installation procedures will be installed as described in the FSP with additional specifications to minimize potential turbidity in groundwater samples. These specifications include:

- The monitoring well will be installed using an outer casing.
- The monitoring well will consist of 2-inch diameter well (standard) within an 8-inch annular space.
- A 0.005 slotted screen will be used.
- After installing the well screen and riser, the outer casing will be removed from the borehole.

After completion and development of the monitoring well, a groundwater sample will be collected during Field Event #2 as described in the FSP and submitted to the contract laboratory for TAL Metals and hexavalent chromium analysis.

In addition to the installation of the monitoring well above, groundwater samples will be collected from 3 additional locations (Figure 4). Two of the groundwater samples will be collected using direct-push groundwater grab sampling methods. The third sample is co-located with a monitoring well (MW-4637S) being installed as part of investigations described under Task 15. The samples from the two boreholes and monitoring well MW-4637S will be submitted to the contract laboratory for TAL Metals and hexavalent chromium analysis.

These groundwater samples will be used to evaluate the presence of chromium in groundwater. These locations are also selected to determine if groundwater is preferentially migrating along underground utility lines. Sampling locations may be adjusted based on the locations of the sewer lines in the area.

Task 6. AOI-09 Barrel, Rack, and U1 Plating Line

Elevated concentrations of total chromium, above preliminary site-wide background concentration ranges, were detected in shallow soil from locations GP-4091 and GP-4092. The sample locations at AOI-09 were placed adjacent to sumps located within the AOI. Based on the detection of chromium in shallow soil samples, releases from the sump are not suspected. The source and valance of the elevated chromium in shallow soil is not known. Thus, 3 additional soil borings

will be installed as shown on Figure 4. These locations are selected to further characterize the shallow soil and determine the chromium species present in soil.

Soil samples will be collected from each location as described in the FSP. Soil samples will be collected from 0 to 2 ft. and 6 to 8 ft. The soil samples will be submitted to the contract laboratory for TAL Metals and hexavalent chromium analysis.

Task 7. AOI-11 Executive Garage Area

Pre-RFI soil samples from the vicinity of the Executive Garage had elevated concentrations of BTEX. Benzene in pre-RFI groundwater data was greater than industrial screening criteria. Due to the presence of these constituents, the area was deed restricted to industrial use in 1996. The current soil and groundwater conditions are unknown.

In addition, Tank #4039, which was reported to be on the upgradient edge of the restricted area, was closed in place by filling with sand in 1978 (without confirmation soil or groundwater sampling). The exact location of this tank is unknown.

To assess the potential of a release from Tank #4039, a monitoring well will be installed in the first saturated zone as shown in Figure 5. This location is selected to be on the downgradient edge of the reported area of the UST. Soil samples will be collected during the installation of the monitoring well as described in the FSP. These soil samples will be submitted to the contract laboratory for TCL VOC, TCL SVOC, and lead analysis.

In addition to the monitoring well discussed above, a second monitoring well will be installed approximately between the abandoned monitoring wells MW-4006 and MW-4007 locations. Soil samples will be collected during the installation of the monitoring well as described in the FSP. These soil samples will be submitted to the contract laboratory for TCL VOC, TCL SVOC and lead analysis.

Upon completion of the installation and development of the monitoring wells discussed above, 5 monitoring wells (two new and three existing as shown on Figure 5) will be sampled during Field Event #2 using the low-flow sampling method as described in the FSP. Groundwater samples will be submitted to the contract laboratory for TCL VOC, TCL SVOC, and lead analysis. These data will be used to assess the current groundwater conditions at this AOI.

Task 8. AOI-13 Gridley Area

Based on fluid measurement during Field Event #1, two additional monitoring wells will be installed to confirm the extent of free product (LNAPL) in the Gridley Area. The locations of these monitoring wells are shown on Figure 6 and are selected to replace abandoned monitoring well MW-4414 and provide monitoring locations and confirmation of the southeastern extent of the LNAPL.

Soil samples will be collected from each location as described in the FSP. The results from these soil samples will be used to confirm pre-RFI soil data. The soil samples will be submitted to the contract laboratory for TAL Metals, TCL VOC, TCL SVOC, and TCL PCB analysis. In addition one soil sample from each distinct soil type will be collected and submitted for physical characterization (e.g., grain size analysis, bulk density, porosity, hydraulic conductivity) to support the selection of site-specific inputs for vapor intrusion modeling.

After completion and development of the two new monitoring wells, these two monitoring wells and the 14 existing monitoring wells will be monitored monthly to evaluate the presence and extent of free product during the monthly groundwater measurements described under Task 3. The wells include:

MW-4401	MW-4402	MW-4403	MW-4404
MW-4405	MW-4406	MW-4407	MW-4408
MW-4410	MW-4411	MW-4412	MW-4413
MW-4415	MW-4416	MW-4417$^{(new)}$	MW-4418$^{(new)}$

Free product samples will be collected during Field Event #2 from MW-4403 and MW-4410 using single-use Teflon® bailers. The samples will be submitted to the contract laboratory for hydrocarbon fuel scan analysis to determine an average molecular weight of the product. These data will be used to model LNAPL vapor migration to indoor air.

Based on pre-RFI data and LNAPL analysis, it is not suspected that groundwater quality has been adversely affected in this area. To confirm that groundwater has not been adversely affected by the presence of LNAPL, three groundwater samples will be collected during Field Event #2 from MW-4408, MW-4410 and MW-4417 (Figure 6).

If LNAPL is present, groundwater samples from MW-4408 and MW-4410 will be obtained using a Teflon® bailer. Use of a submersible pump and low-flow sampling methods as described in the FSP are not being employed at these two wells at this time due to the potential of contaminating the sampling equipment and groundwater sample as the equipment passed through LNAPL into the

groundwater. Groundwater from the MW-4417, expected to be free of LNAPL and located downgradient of the LNAPL, will be collected using low-flow methods described in the FSP.

Groundwater samples will be submitted to the contract laboratory for TAL Metals, TCL VOC, TCL SVOC, and TCL PCB analysis. Samples submitted for TCL VOC analysis will be collected during a single sampling event. Collection of groundwater for other parameters may be performed over a several day period to obtain sufficient sample volume to perform the analysis.

These data will be used to make an initial determination of whether groundwater has been adversely affected by constituents dissolving into groundwater from the LNAPL. If hazardous constituents are detected in the groundwater samples, more rigorous groundwater sampling methods to limit potential mixing of product and groundwater may be used to resample the well.

A separate interim measures work plan will be prepared describing additional activities designed to enhance free product recovery already taking place at this AOI.

Task 9. AOI-22 Chip Collection Area

Based on observations of ground staining in the Chip Collection Area, two monitoring wells will be installed as described in the FSP to evaluate soil conditions and evaluate the presence or absence of free product. The locations of the monitoring wells are shown on Figure 7.

Soil samples will be collected during the installation of the monitoring wells as described in the FSP. Soil samples will be submitted to the contract laboratory for TAL Metals, TCL VOC, TCL SVOC and TCL PCB analysis.

Based on the geology encountered at each location, monitoring wells will be installed with the screen straddling the water table to monitor for potential free product. The monitoring wells will be monitored monthly for free product during the monthly groundwater measurements described under Task 3. Groundwater samples will be collected if soil results indicate a potential for groundwater contamination, or if free product is detected in the monitoring wells.

Task 10. AOI-26 Container Storage Area

Results from pre-RFI investigations and RFI groundwater samples collected from existing monitoring wells indicate that VOC concentrations in groundwater near the storage area are present at concentrations above the screening criteria. The groundwater contamination was found to be limited to the uppermost saturated

zone. There was no evidence to suggest that a lower saturated zone, located under 10 to 14 feet of confining clay, has been adversely affected.

U.S. EPA completed a Preliminary Assessment/Visual Site Inspection (PA/VSI), dated October 2002, and provided this document to Delphi in February of 2003. The PA/VSI identified four SWMUs in the area of AOI-26 that require additional characterization, including the Container Storage Area. The SWMUs in this area identified as needing additional characterization in the PA/VSI include:

SWMU 1	Container Storage Area (AOI-26)
SWMU 2	Used Oil Storage Area
SWMU 4	Former Used Oil Storage Tanks
SWMU 17	Former Solvent Storage Tanks #4019 and #4049

Based on the findings of the December 2002 Current Conditions Report (CCR), the PA/VSI, and available analytical data, a sampling program will be undertaken during Field Event #2 to characterize current soil and groundwater conditions in the Container Storage Area and SWMUs in the vicinity. Due to the historical use of the area, biased sampling is not feasible. As such, the sampling program is based on a random grid sampling approach with supplemental locations added to characterize soil conditions at SWMU 2, SWMU 4 and SWMU 17. Soil characterization samples will be collected from a total of 12 sampling locations within SWMUs 1, 2, 4, and 17.

Nine of the 12 locations were selected based on Michigan DEQ statistical guidance on random sampling programs under Part 201. A 300 ft. by 300 ft., 9-cell grid was superimposed over the center of AOI-26 (SWMU 1) (Figure 8). The first sampling location was randomly selected within the first cell of the grid using an electronic random numbers generator. The remainder of the locations were established based on this randomly selected location, creating a 100 ft. by 100 ft. sampling grid. Additional soil sampling locations were placed at SWMUs 2, 4 and 17.

Soil samples will be collected at each location as described in the FSP. Soil samples will be submitted to the contract laboratory for TCL VOC, TCL SVOC and TAL Metals analysis.

A monitoring well (MW-4122) will be installed downgradient of AOI-26 as shown on Figure 8 to evaluate potential groundwater contamination associated with the entire AOI-26 area. The monitoring well will be installed as described in the FSP and screened in the first saturated zone.

Groundwater samples will be collected during Field Event #2 from 16 monitoring wells. These monitoring wells are;

MW-4101	MW-4106	MW-4112	MW-4120
MW-4102	MW-4107	MW-4113	MW-4121
MW-4103	MW-4110	MW-4114	MW-4122
MW-4104	MW-4111	MW-4115	MW-4611

Groundwater samples from the wells indicated above will be collected using low-flow methods as described in the FSP. The groundwater samples will be submitted to the contract laboratory for TCL VOC analysis.

Task 11. AOI-35 Glass Fritter (SWMU 11)

The CCR identified the Glass Fritter Area as AOI-35. The glass frit operations utilized several types of glass seal powder. The various glass seal powders contained metals including up to 2% antimony, 25% aluminum, 45% iron, and 65% copper. Site personnel observed glass seal powder stored in the building and on the ground surface outside of the building. The area surrounding Building #4128 is paved and the paving was observed intact. Surface water run-off is collected in storm water drains connected to the WWTP. No further investigation was considered required at this AOI.

Subsequently, USEPA's PA/VSI identified AOI-35 as a SWMU and recommended soil sampling in this area. Although the CCR concluded that investigations of AOI-35 was not warranted, confirmation sampling will be performed in Field Event #2 since the area was identified for further sampling in the PA/VSI and no previous investigations were undertaken in this area.

Three shallow (0 to 2 feet below ground surface) soil samples will be collected from this area, biased toward areas most likely effected by any potential release of glass seal powder. Areas will be selected in the field based on site features and conditions such as surface run-off patterns, cracks or deteriorated concrete or paving, and uncovered ground surface in the vicinity of the AOI. These samples will be submitted to the contract laboratory for TAL Metals analysis.

Task 12. AOI-40 Former Oleum UST (Tank #4023)

The exact location of the former Oleum UST (Tank #4023) is not known. As such, to assess the potential of a release from Tank #4023, a monitoring well will be installed in the first saturated zone. The location of the monitoring well, MW-4641S, shown in Figure 4, is was selected to be downgradient of the reported area of the former UST.

Soil samples will be collected during the installation of the monitoring well as described in the FSP. These soil samples will be submitted to the contract laboratory for TCL VOC, TCL SVOC, and TCL PCB analysis.

After completion of the installation and development of the monitoring well, the monitoring well will be sampled during Field Event #2 using low-flow sampling methods as described in the FSP. Groundwater samples will be submitted to the contract laboratory for TCL VOC, TCL SVOC, and TCL PCB analysis.

This monitoring well will be monitored monthly for free product during the monthly groundwater measurements described under Task 3.

Task 13. AOI-45 Compactor

Benzo(a)pyrene was detected in shallow soil at concentrations slightly above the industrial direct contact screening criterion at location B-4452. To further delineate and characterize benzo(a)pyrene concentrations in this area, two additional soil boring locations, shown in Figure 9, will be advanced and sampled as described in the FSP. Soil samples will be submitted to the contract laboratory for TCL SVOC analysis.

Task 14. AOI-48 Groundwater (Northwest, Southeast)

AOI-48 is addressing two areas of VOCs detected in groundwater located beneath the northwest and southeast corners of the property.

Northwest (Corner of Dort Highway & Davison Road)

Samples from investigations in the northwest corner of the property have detected concentrations of trichloroethene (TCE) and TCE degradation products in soil and groundwater extending north of Davison Road (completed in February 2003) and in groundwater west of North Dort Highway. The majority of the water samples have been collected using direct-push technology (groundwater grab or borehole water samples).

The groundwater flow beneath the northwest corner of the property is influenced by the absence of the aquitard. This results in the flow of the first saturated zone into the second saturated zone, which causes a mounding of groundwater in the second saturated zone.

TCE has been detected north of Davison Road in a soil sample collected in the first saturated zone (above the aquitard). Although wet, a groundwater grab sample could not be obtained from the borehole at this location. TCE was not detected in groundwater samples from the second saturated zone north of Davison Road.

Groundwater flow in the first saturated zone north of Davison Road is assumed to flow south towards the site.

TCE has been detected in groundwater in the second zone extending southeast from the northern property boundary to west of North Dort Highway. Based on available analytical data and groundwater conditions, it appears that the source of the TCE may be off-site. To further characterize the soil and groundwater in the northeast corner of the site, three geoprobe boring locations, nine monitoring wells locations and two piezometer (nested pairs if the first saturated sand is present) will be installed as shown on Figure 10.

Three geoprobe borings will be advanced at the locations shown on Figure 10. These locations were selected to extend the soil and groundwater characterization north of Davison Road. These borings will be advanced prior to the installation of monitoring wells North of Davison Road.

Continuous soil samples will be collected from the Geoprobe® boring to determine soil stratigraphy. Groundwater grab samples will be collected from up to three depth intervals at each boring based on the soil stratigraphy and the results of field screening. If groundwater grab samples cannot be obtained, soil samples will be collected. Soil and groundwater samples will be submitted to the Contract Laboratory and analyzed for TCL VOC with a 7-day analysis turn-around time. The location of monitoring well cluster MW-4625, installed as described below, may be adjusted based on the results of these samples.

The drilling to install monitoring wells will include casing off the upper sand (when aquitard layer is present) prior to drilling into the lower sand to prevent the potential vertical migration of contaminants during the drilling process. When the aquitard is present, a monitoring well will be installed in the first saturated zone and two monitoring wells will be installed in the second saturated zone. When the aquitard is not present, two monitoring wells will be installed in the second saturated zone.

Visual soil classification will be performed at each location and the borehole for the deepest well will be advanced to approximately 40 feet to confirm the elevation of the bottom of the second saturated sand zone. The deepest monitoring well at each location will be set just above the bottom of the saturated zone. The second monitoring well in the second saturated zone will be installed at the top of saturated zone.

With the exception of monitoring wells north of Davison Road, soil samples will be collected during monitoring well installation as described in the FSP from each

monitoring well cluster location. Soil samples north of Davison Road were previously collected and analyzed in January 2003. Based on those results, further sampling is not required. Soil samples will be submitted to the contract laboratory for TCL VOC analysis.

After completion and development of the monitoring wells, groundwater samples will be collected during Field Event #2 from up to 25 monitoring wells (Figure 10). These wells include;

MW-4601	MW-4601D	MW-4602	MW-4604D
MW-4620D	MW-4620S	MW-4623D	MW-4623S
MW-4624S	MW-4624D	MW-4625S	MW-4625M
MW-4625D	MW-4626S	MW-4626D	MW-4627S
MW-4627D	MW-4628S	MW-4628D	MW-4629S
MW-4629D	MW-4630S	MW-4630D	MW-4631S
MW-4631D			

The groundwater samples will be submitted to the contract laboratory for TCL VOC analysis. These data will be used to confirm the extent of TCE in groundwater at the property boundary.

Southeast

During Field Event #1, groundwater samples were collected from beneath Building #4111 to evaluate the extent of TCE and its degradation products identified in the southeast corner of the property. Samples were submitted to a mobile laboratory for analysis. Elevated concentrations of TCE were detected in these samples. In order to confirm the presence of TCE in this area, three permanent monitoring wells will be installed. The additional wells will complete the monitoring well network in this area and characterize the groundwater conditions beneath Building #4111.

The monitoring well locations are shown on Figure 11. The monitoring wells will be installed as described in the FSP. Soil samples will be collected from each location as described in the FSP. The monitoring wells MW-4642S and MW-4643S will be installed and screened in the first saturated zone. The monitoring well will be installed approximately 1 foot into the aquitard extending up into the first saturated zone. The monitoring well MW-4118D will be installed in the second saturated zone adjacent to existing monitoring well MW-4118. The drilling to install monitoring wells in the second saturated zone will include casing off the upper sand prior to drilling into the lower sand to prevent potential vertical migration of contaminants during the drilling process.

During Field Event #1, monitoring wells MW-4117 and MW-4118 were dry. These wells will be sampled, if water is present, during Field Event #2. If these wells are still dry, the wells will be abandoned as described in the FSP and replaced with wells screened in the first saturated zone in order to collect groundwater samples from this area.

After completion and development of the monitoring wells, groundwater samples will be collected during Field Event #2 from 12 monitoring wells (Figure 11). The soil and groundwater samples will be submitted to the contract laboratory for TCL VOC analysis. These data will be used to characterize groundwater conditions in this area.

Task 15. AOI-49 Building 4082

Monitoring well MW-4622S was installed during Field Event #1 to evaluate site-wide groundwater conditions. Chlorinated compounds were detected in groundwater and soil samples collected from this location. The chlorinated compounds were confined to the first saturated zone. Based on this finding and subsequent field delineation, three additional monitoring wells will be installed in the first saturated zone to characterize the soil and groundwater conditions.

The locations of the monitoring wells are shown on Figure 4. The monitoring well installation and soil samples collection from each location will be performed as described in the FSP. Soil samples will be submitted to the contract laboratory for TCL VOC analysis. Samples from monitoring well MW-4637S are also identified under Task 5 for TAL Metals analysis.

After completion and development of the monitoring wells, the three new monitoring wells and two existing monitoring wells will be sampled during Field Event #2 using low-flow sampling methods as described in the FSP. Groundwater samples will be submitted to the contract laboratory for TCL VOC analysis.

Task 16. AOI-50 Crane Bay

Monitoring well MW-4621S was installed during Field Event #1 to evaluate site-wide groundwater conditions. During installation of the monitoring well, visual evidence of free product was observed in the soil samples. After completion of MW-4621S, LNAPL was detected in the monitoring well. Subsequent LNAPL sample analysis detected chlorinated compounds, but did not detect TCL PCB.

The extent of free product at this AOI was delineated using visual observations during Field Event #1. To characterize and confirm the extent of free product, five monitoring wells will be installed at the locations shown on Figure 12. Monitoring

wells will be installed as described in the FSP with the screens placed to straddle the shallow water table.

Soil samples will be collected during the installation of the monitoring wells as described in the FSP. These soil samples will be submitted to the contract laboratory for TCL VOC, TCL SVOC, and TCL PCB analysis. In addition one soil sample from each distinct soil type will be collected and submitted for physical characterization (e.g., grain size analysis, bulk density, porosity, hydraulic conductivity) to support the selection of site-specific inputs for vapor intrusion modeling.

After completion of the installation and development of the monitoring well, the monitoring wells will be sampled using low-flow sampling methods as described in the FSP. Groundwater samples will be submitted to the contract laboratory for TCL VOC, TCL SVOC, and TCL PCB.

One LNAPL sample will be collected from MW-4621S and submitted to the contract laboratory for hydrocarbon fuel scan analysis to determine an average molecular weight of the product. This datum will be used to model LNAPL vapor migration to indoor air. An additional LNAPL sample, if present, will be collected from MW-4635S. This sample, if collected, will be submitted to the contract laboratory for TCL VOC, TCL SVOC, TCL Metals, TAL PCBs, viscosity, density and hydrocarbon fuel scan analysis.

These six monitoring wells (5 new and one existing) will be monitored monthly for the presence and extent of free product during the monthly groundwater measurements described under Task 3. A separate interim measures work plan will be prepared describing additional activities to recover free product at this AOI.

Task 17. AOC 1 - Plating Lines (AOI-3, AOI-4, AOI-17, & AOI-19)

USEPA's PA/VSI identified AOC 1 as "Plating Lines" and recommended soil sampling at all former and currently operated plating lines. These "Plating Lines" were identified in the CCR as;

AOI-3	Former Plating Operations (Building 4099)
AOI-4	Former Plating Operations (Building 4101)
AOI-8	Former Hard Chrome Plating Line (Building 4082)
AOI-9	Barrel, Rack, and U1 Plating Line (Building 4051/4050)
AOI-17	Nickel Plating Line (Building 4094)
AOI-18	Former Zinc Dichromate Plating Lines (West Plating Lines, Building 4100)
AOI-19	Former Zinc Hydroxide Tanks

Three of these areas, AOI-08, AOI-09 and AOI-18, were determined to require further investigation based on the CCR and, thus, were investigated during Field Event #1.

Based on review of records and available pre-RFI and RFI data, further investigation of AOI-19 Former Zinc Hydroxide Tanks is not warranted. As discussed in the CCR, samples collected from the wall and floor of the tank excavation were less than residential Part 201 Michigan Generic Cleanup Criteria. Furthermore, the plating lines located adjacent to these tanks were investigated during Field Event #1. Soil borings located adjacent to the former tanks did not detect elevated zinc concentrations (the only constituent of potential concern in this area). Groundwater collected in the area as part of the site-wide groundwater monitoring did not indicate elevated levels of zinc in the area. As such, further investigation of these tanks is not warranted.

However, based on the recommendations presented in the PA/VSI, one soil boring will be installed at three of the locations identified by the PA/VSI as AOC 1. These plating lines, AOI-3, AOI-4, and AOI-17, do not have pre-RFI investigation data, thus one soil boring will be advanced at each of these locations as shown on Figure 13. Soil samples will be collected as described in the FSP. In addition, a groundwater grab sample will be collected from each boring. Soil and groundwater samples will be submitted to the contract laboratory for TAL Metals analysis.

2.4 Location Surveying

Task 18. Monitoring Well Survey

A site survey to determine elevation and the horizontal location of each monitoring well installed during the above tasks will be performed as described in the RFI Work Plan and FSP. Monitoring wells installed during Field Event #2 will be surveyed for horizontal and vertical control, (North American Vertical Datum or NAVD). Survey elevations will be to the nearest 0.01 feet.

In addition, two locations along Gilkey Creek will be surveyed to allow sediment bed and surface water elevation measurements. These locations will be identified in the field based on available access and surface features.

III. SCHEDULE

Field Event #2 will be undertaken according to the attached field schedule, Figure 14.

TABLES

TABLE I
SCOPE OF WORK - FIELD EVENT 2
FLINT-EAST - PLANT 400
FLINT, MICHIGAN

Task #	AOI or Area Designation	Investigation Purpose	Proposed Field Investigation (Does not include sampling of existing monitoring wells)	Maximum Number of Groundwater Samples	Maximum Number of Soil Samples	Maximum Number of Free Product Samples	Proposed Analytical Investigation
1	Supplemental Background Sampling	Supplement background soil data set	Collect soil samples during Task 2 & Task 14	-	12	-	TAL Metals
2	Supplemental Site-Wide Monitoring Well Installation	Groundwater flow Interpretation	Install 2 monitoring wells	-	See Task 1	-	See Task 1
3	Groundwater Elevation Measurements	Evaluate groundwater flow direction	Monitoring well network for monthly groundwater elevation measurements listed in Table 2	-	-	-	-
4	Supplemental Geological Characterization of Aquitard	Collect quantitative information and physical characteristics of aquitard	Collect six soil samples from clay aquitard across site.	-	6	-	Triaxial permiability testing and other soil characteristics
5	AOI-8 Former Hard Chrome Plating Line	Confirm concentration of hexavalent chromium	Install 1 monitoring well and 2 soil borings.	3	-	-	TAL Metals and hexavalent chromium
6	AOI-9 Barrel, Rack, and U1 Plating Line	Confirm concentration of chromium	Install 3 soil borings	-	6	-	TAL Metals and hexavalent chromium
7	AOI-11 Executive Garage Area	Confirm concentrations of BTEX	Install 2 monitoring well	5	6	-	TCL VOCs, TCL SVOCs, and lead
8	AOI-13 Gridley Area	Confirm extent of free product	Install 2 monitoring wells	3	6	2	TAL Metals, TCL VOCs, TCL SVOCs, and TCL PCBs; hydrocarbon fuel scan; soil characteristics
9	AOI-22 Chip Collection Area	Evaluate soil conditions and presence of free product	Install 2 monitoring well. Monitor for free product	-	6	2	TAL Metals, TCL VOCs, TCL SVOCs, and TCL PCBs
10	AOI-26 Container Storage Area	Characterize current soil and groundwater conditions	Install 12 soil borings and 1 monitoring well	16	36	-	TCL VOCs, TCL SVOCs, and TAL Metals
11	AOI-35 Glass Fritter	Confirmation soil sampling	Install 3 soil borings	-	3	-	TAL Metals
12	AOI-40 Former Oleum UST	Assess potential of release	Install 1 monitoring well	1	3	-	TCL VOCs, TCL SVOCs, and TCL PCBs
13	AOI-45 Compactor	Delineate the extent of benzo(a)pyrene	Install 2 soil borings	-	6	-	TCL SVOCs
14	AOI-48 Groundwater (Northwest)	Characterize soil and groundwater	Install 3 soil borings, 19 monitoring wells, 2 piezometers	25	33	-	TCL VOCs (see Task 1)
14	AOI-48 Groundwater (Southeast)	Characterize soil and groundwater	Install 3 monitoring wells	10	9	-	TCL VOCs
15	AOI-49 Building 4082	Characterize soil and groundwater	Install 3 monitoring wells	5	9	-	TCL VOCs
16	AOI-50 Crane Bay	Confirm extent of free product	Install 5 monitoring wells. Collect LNAPL sample	5	15	2	TCL VOCs, TCL SVOCs, TAL Metals, TCL PCBs, viscosity, density, and hydrocarbon fuel scan; soil characteristics
17	AOC-1 Plating Lines (AOI-3, AOI-4, & AOI-19)	Soil Characterization	Install 3 soil borings	-	9	-	TAL Metals
18	Monitoring Well Survey	Determine elevations and horizontal location of wells	Survey for horizontal and veritcal control	-	-	-	-

Notes and Abbreviations:

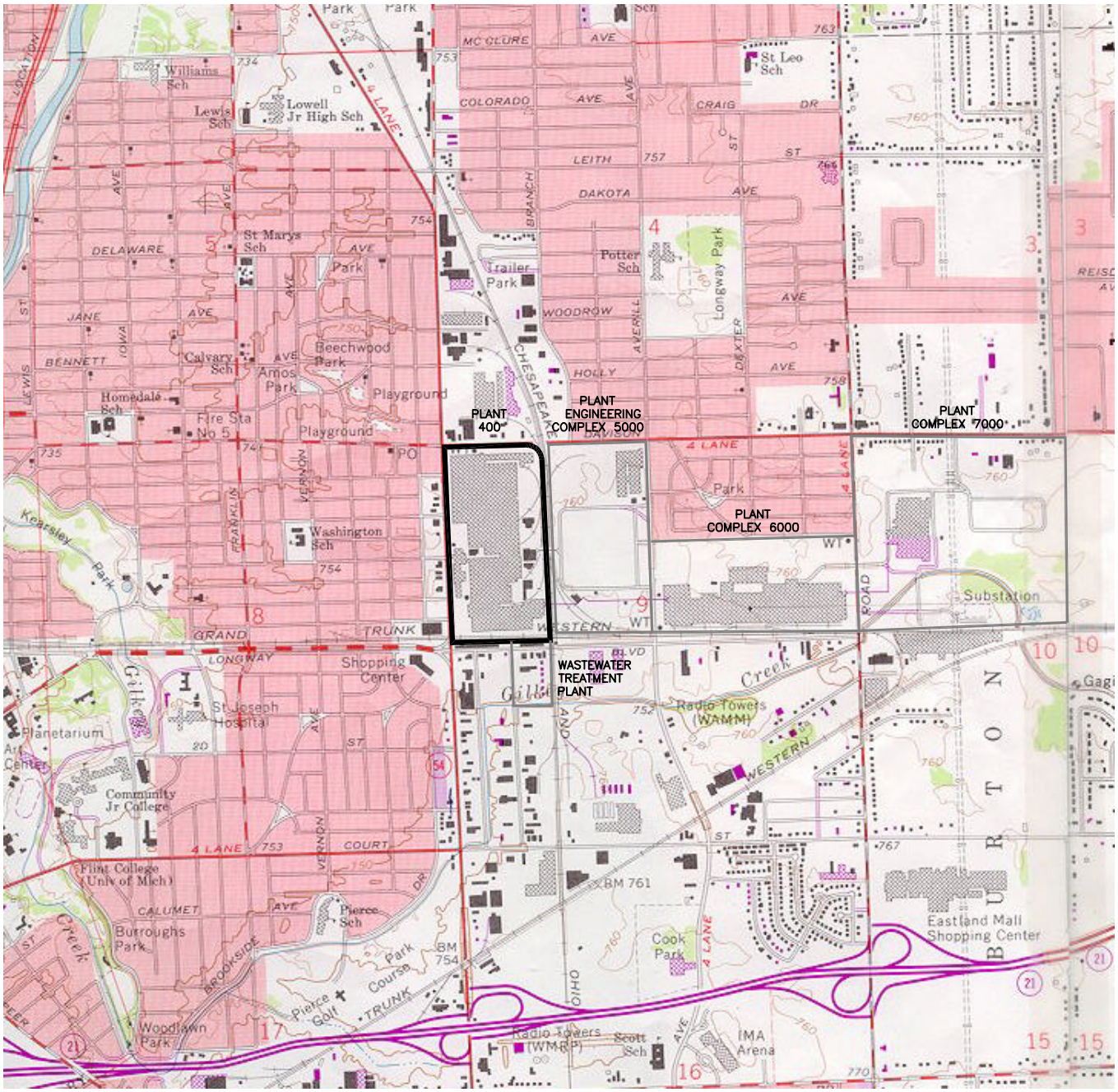
1. Actual number of soil samples collected will be based on field conditions including depth to groundwater, field screening, and visual observations.

TABLE II
SITE-WIDE MONITORING WELL NETWORK
DELPHI DORT HWY
FLINT, MICHIGAN

Well ID	Date Installed	Monitoring Saturated Zone	Well ID	Date Installed	Monitoring Saturated Zone
MW-4003	11-Jan-90	First	MW-4613	06-Apr-00	First
MW-4004	11-Jan-90	Second	MW-4614	06-Apr-00	First
MW-4005	24-Oct-91	Second	MW-4615	06-Apr-00	Second
MW-4008	**NEW**	First	MW-4620S	12-Jun-02	Second
MW-4009	**NEW**	First	MW-4621D	14-Jun-02	Second
MW-4101	23-May-90	First	MW-4621S	13-Jun-02	First
MW-4102	21-May-90	First	MW-4622D	13-Jun-02	Second
MW-4103	22-May-90	First	MW-4622S	11-Jun-02	First
MW-4104	21-May-90	First	MW-4623D	14-May-02	Second
MW-4106	22-May-90	First	**MW-4624S**	**NEW**	First
MW-4107	20-Sep-90	Second	**MW-4624D**	**NEW**	Second
MW-4110	18-Apr-91	First	**MW-4625S**	**NEW**	First
MW-4111	10-Apr-91	Second	**MW-4626D**	**NEW**	Second
MW-4112	18-Apr-91	Second	**MW-4626S**	**NEW**	First
MW-4113	18-Apr-91	Second	**MW-4626D**	**NEW**	Second
MW-4114	23-May-94	First	**MW-4626M**	**NEW**	First
MW-4115	23-May-94	First	**MW-4627S**	**NEW**	First
MW-4116	25-May-94	Second	**MW-4627D**	**NEW**	Second
MW-4117	23-May-94	First	**MW-4628S**	**NEW**	First
MW-4118	23-May-94	First	**MW-4628D**	**NEW**	Second
MW-4118D	**NEW**	Second	**MW-4629S**	**NEW**	First
MW-4119	24-May-94	First	**MW-4629D**	**NEW**	Second
MW-4120	23-May-94	First	**MW-4630S**	**NEW**	First
MW-4121	25-May-94	Second	**MW-4630M**	**NEW**	First
MW-4122	**NEW**	First	**MW-4630D**	**NEW**	Second
MW-4401	23-Oct-91	Second	**MW-4631S**	**NEW**	First
MW-4402	24-Oct-91	Second	**MW-4631D**	**NEW**	Second
MW-4403	23-Oct-91	Second	**MW-4631M**	**NEW**	First
MW-4404	23-Oct-91	Second	**MW-4632S**	**NEW**	First
MW-4405 (RW-5)	26-May-93	Second	**MW-4633S**	**NEW**	First
MW-4406	26-May-93	Second	**MW-4634S**	**NEW**	First
MW-4407	26-May-93	First	**MW-4635S**	**NEW**	First
MW-4408	22-Jul-94	First	**MW-4636S**	**NEW**	First
MW-4410	22-Jul-94	First	**MW-4637S**	**NEW**	First
MW-4415*		Second	**MW-4638S**	**NEW**	First
MW-4416*		Second	**MW-4639S**	**NEW**	First
MW-4417	**NEW**	First	**MW-4640S**	**NEW**	First
MW-4418	**NEW**	First	**MW-4641S**	**NEW**	First
MW-4501	19-Nov-92	First	**MW-4642S**	**NEW**	First
MW-4502	20-Nov-92	First	**MW-4643S**	**NEW**	First
MW-4503	20-Nov-92	First	**MW-4644S**	**NEW**	First
MW-4601	03-Apr-00	First	**MW-4645S**	**NEW**	First
MW-4602	03-Apr-00	Second	**PZ-4001**	**NEW**	
MW-4603	04-Apr-00	Second	**PZ-4002**	**NEW**	
MW-4604	04-Apr-00	Second	**VHC-4001**	**NEW**	
MW-4604D	14-May-02	Second	**VHC-4002**	**NEW**	
MW-4605	04-Apr-00	Second	**VHC-4003**	**NEW**	
MW-4605D	13-May-02	Second	**VHC-4004**	**NEW**	
MW-4606	04-Apr-00	Second	**VHC-4005**	**NEW**	
MW-4606D	**NEW**	Second	**VHC-4006**	**NEW**	
MW-4607	04-Apr-00	Second			
MW-4608	05-Apr-00	Second			
MW-4608D	**NEW**	Second			
MW-4609	05-Apr-00	First			
MW-4610	05-Apr-00	Second			
MW-4610D	16-May-02	Second			
MW-4610S	16-May-02	First			
MW-4612	06-Apr-00	Second			

Notes:
* No boring logs available

FIGURES



USGS QUADRANGLE: FLINT NORTH, MICH.

HALEY & ALDRICH

UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS

DELPHI ENERGY AND CHASSIS SYSTEMS
PLANT 400 – 1300 NORTH DORT HIGHWAY
FLINT, MICHIGAN

SITE LOCATION MAP

SCALE: 1 IN. = 2,000 FT.

AUGUST 2002

FIGURE 1

G:\49017\001\DOCC\Figures\Figure_1.dwg

DAVISON ROAD

4080X
4138
4091
4080
4107
4133
4134
4202
N
4100
4158
4159
4177
C & O
RAILROAD
4094
4175
4128
4108
4081
4131
4095
4198
4141
4102
EAST RAMP
4135
4043
4164
4060
5102
SQUAD ROOM
4166
4196
4168
4084
4042
4045
4045X
4041
4046
4046X
4132
4070
4044
4040
4050
4049
4088
4072
4082
4083
4047
4051
4085
4101X
4156
4140
4121
4087
4111
4101
4089
4090
4099
4157
4193
GRAND TRUNK WEST
RAIL LINE
ROBERT T. LONGWAY BLVD.
DORT HIGHWAY

Legend:

4101 — Building outline with number designation

Notes:

1. Base plan provided by Delphi Corporation.

60 0 60 120 Feet

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PLANT 400\DORT HIGHWAY
FLINT, MICHIGAN

SITE PLAN

SCALE: AS SHOWN AUGUST 2002

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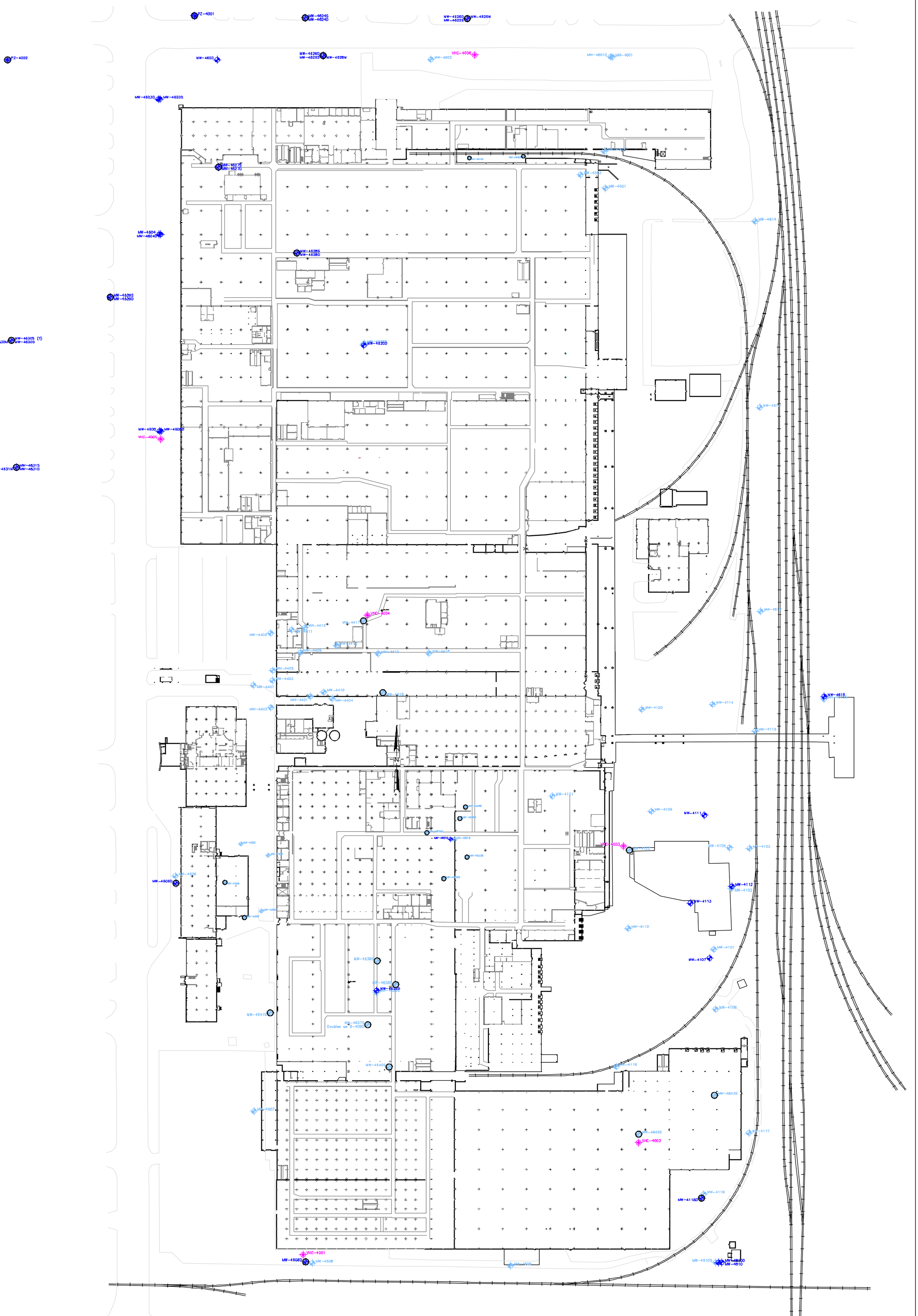
FIGURE 2



LEGEND:

- MW-4611 — Abandoned Monitoring Well
- MW-4107 / MW-4107 — Existing Monitoring Well (First & Second Saturated Zone)
- SP-4001 — Field Event #1 Boring Location
- MW-4808 / MW-4808 — Field Event #2 Monitoring Well (First & Second Saturated Zone)
- SP-1111 — Field Event #2 Boring Location
- VHC-4001 — Field Event #2 Vertical Hydraulic Conductivity Sample Location

NOTES

1. Base Plan Provided by Delphi Corporation
2. Field Event #2 Locations Are Approximate. Locations May Be Modified Based On Site Features And Conditions.

0 50 100 150
SCALE IN FEET

DELPHI CORPORATION
ENERGY & CHASSIS SYSTEMS
FLINT-EAST, PLANT 400, DORT HIGHWAY
FLINT, MICHIGAN

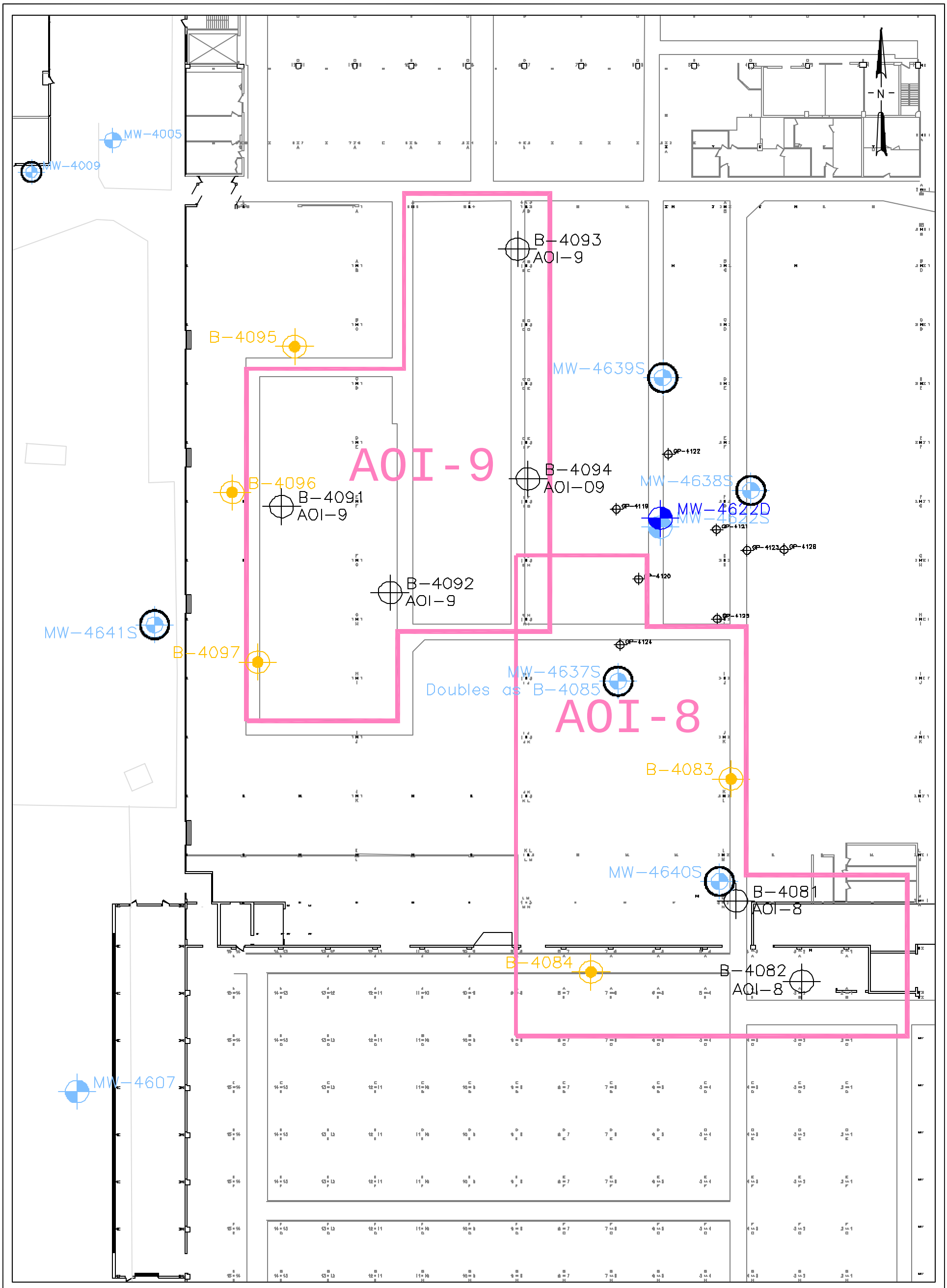
SITE-WIDE GROUNDWATER MONITORING WELL LOCATIONS

SCALE: AS SHOWN

APRIL 2003

FIGURE 3

49017\017\FE2_Work_Plan\Figures\FE2_Sampling_Locations_v3.dwg



LEGEND:

- Abandoned Monitoring Well
- Existing Monitoring Well (First & Second Saturated Zone)
- Field Event #1 Boring Location
- Field Event #2 Monitoring Well (First & Second Saturated Zone)
- Field Event #2 Boring Location
- Field Event #2 Vertical Hydraulic Conductivity Sample Location

0 20 40 60 80

SCALE IN FEET

NOTES

1. Base Plan Provided by Delphi Corporation
2. Field Event #2 Locations Are Approximate. Locations May Be Modified Based On Site Features And Conditions.

DELPHI CORPORATION
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FLINT, MICHIGAN

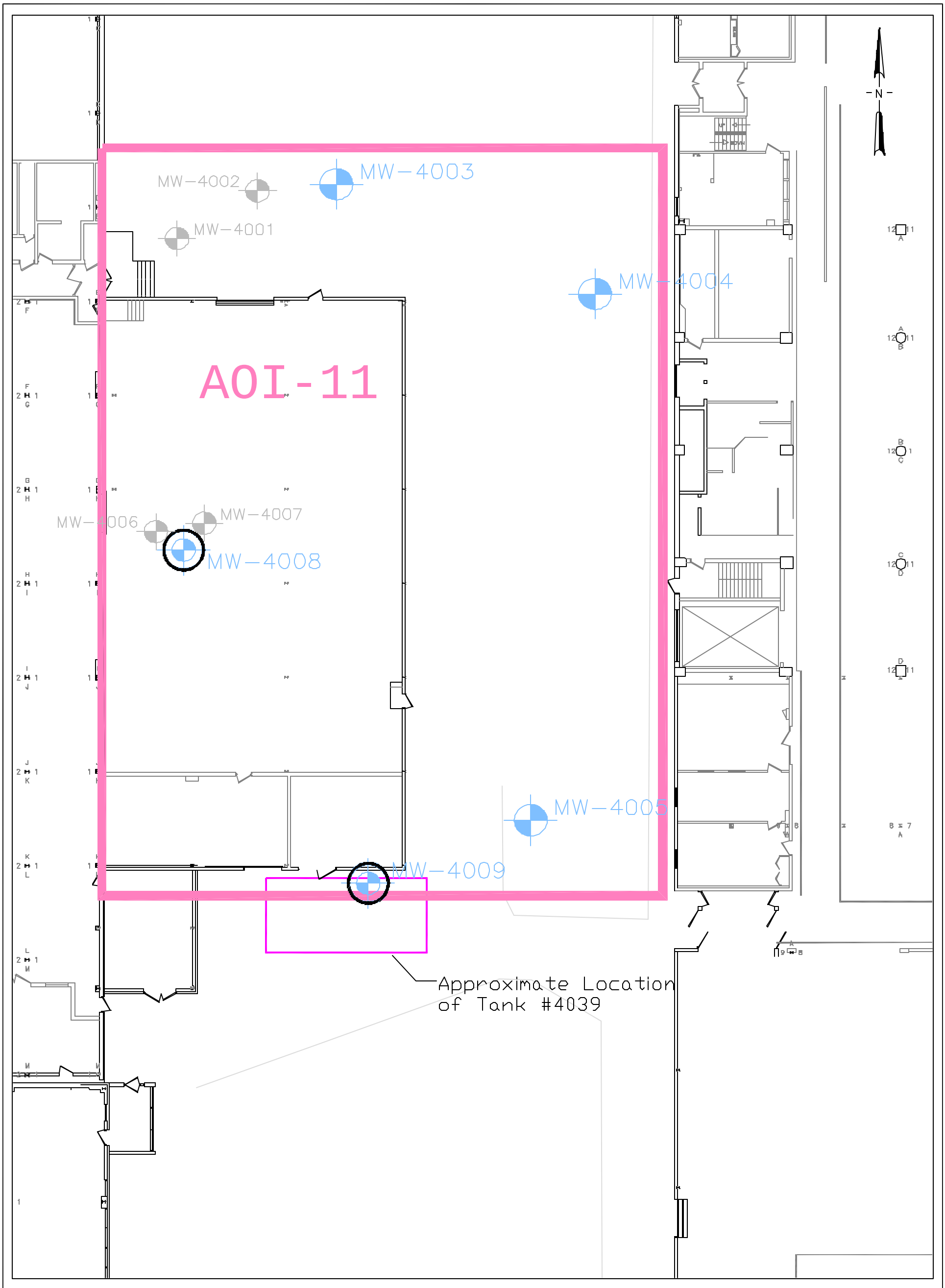
FIELD EVENT #2 SAMPLING LOCATIONS – AOI-08 FORMER HARD CHROME PLATING LINE, AOI-09 BARREL, RACK, AND U1 PLATING AREA, AOI-40 FORMER OLEUM UST & AOI-49 BUILDING 4082.

SCALE: AS SHOWN

APRIL 2003

40017\017\FE2_Work_Plan\Figures\FE2_Sampling_Locations_v3.dwg

FIGURE 4



LEGEND:

- Abandoned Monitoring Well
- Existing Monitoring Well (First & Second Saturated Zone)
- Field Event #1 Boring Location
- Field Event #2 Monitoring Well (First & Second Saturated Zone)
- Field Event #2 Boring Location
- Field Event #2 Vertical Hydraulic Conductivity Sample Location

0 5 10 20 30
SCALE IN FEET

NOTES

1. Base Plan Provided by Delphi Corporation
2. Field Event #2 Locations Are Approximate. Locations May Be Modified Based On Site Features And Conditions.

UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS

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FLINT-EAST, PLANT 400, DORT HIGHWAY
FLINT, MICHIGAN

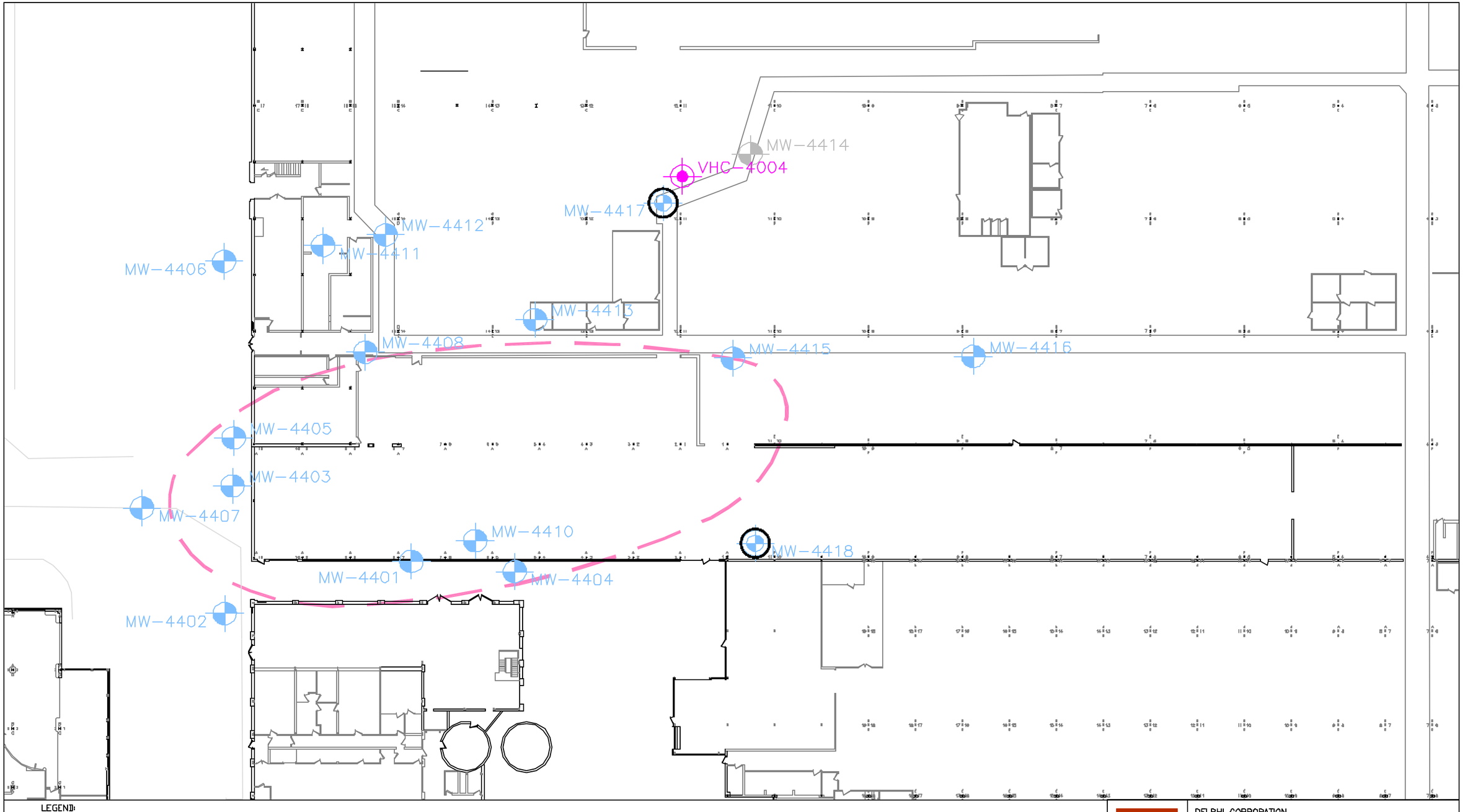
FIELD EVENT #2 SAMPLING LOCATIONS - AOI-11 EXECUTIVE GARAGE

SCALE: AS SHOWN

APRIL 2003

40017\017\FE2_Work_Plan\Figures\FE2_Sampling_Locations_v3.dwg

FIGURE 5



LEGEND:

- Abandoned Monitoring Well
- Existing Monitoring Well (First & Second Saturated Zone)
- Field Event #1 Boring Location
- Field Event #2 Monitoring Well (First & Second Saturated Zone)
- Field Event #2 Boring Location
- Field Event #2 Vertical Hydraulic Conductivity Sample Location
- Estimated extent of free product based on Dec. 2002 Fluid Level Measurement

NOTES:

1. Base Plan Provided by Delphi Corporation
2. Field Event #2 Locations Are Approximate. Locations May Be Modified Based On Site Features And Conditions.
3. Extent of Free Product Thickness based on Dec. 2002 Fluid Level Measurements

0 20 40 60 80

SCALE IN FEET

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FLINT, MICHIGAN

FIELD EVENT #2 SAMPLING LOCATIONS – AOI-13 GRIDLEY AREA

SCALE: AS SHOWN

APRIL 2003

FIGURE 6

40017\017\FE2_Work_Plan\Figures\FE2_Sampling_Locations_v3.dwg

AOI-22

MW-4644S

MW-4645S

N

LEGEND:

- MW-4611 — Abandoned Monitoring Well
- MW-4107 — Existing Monitoring Well (First & Second Saturated Zone)
- BP-4001 — Field Event #1 Boring Location
- MW-480X — Field Event #2 Monitoring Well (First & Second Saturated Zone)
- B-1111 — Field Event #2 Boring Location
- VHC-4001 — Field Event #2 Vertical Hydraulic Conductivity Sample Location

NOTES

1. Base Plan Provided by Delphi Corporation
2. Field Event #2 Locations Are Approximate. Locations May Be Modified Based On Site Features And Conditions.

0 20 40

SCALE IN FEET

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FLINT-EAST, PLANT 400, DORT HIGHWAY
FLINT, MICHIGAN

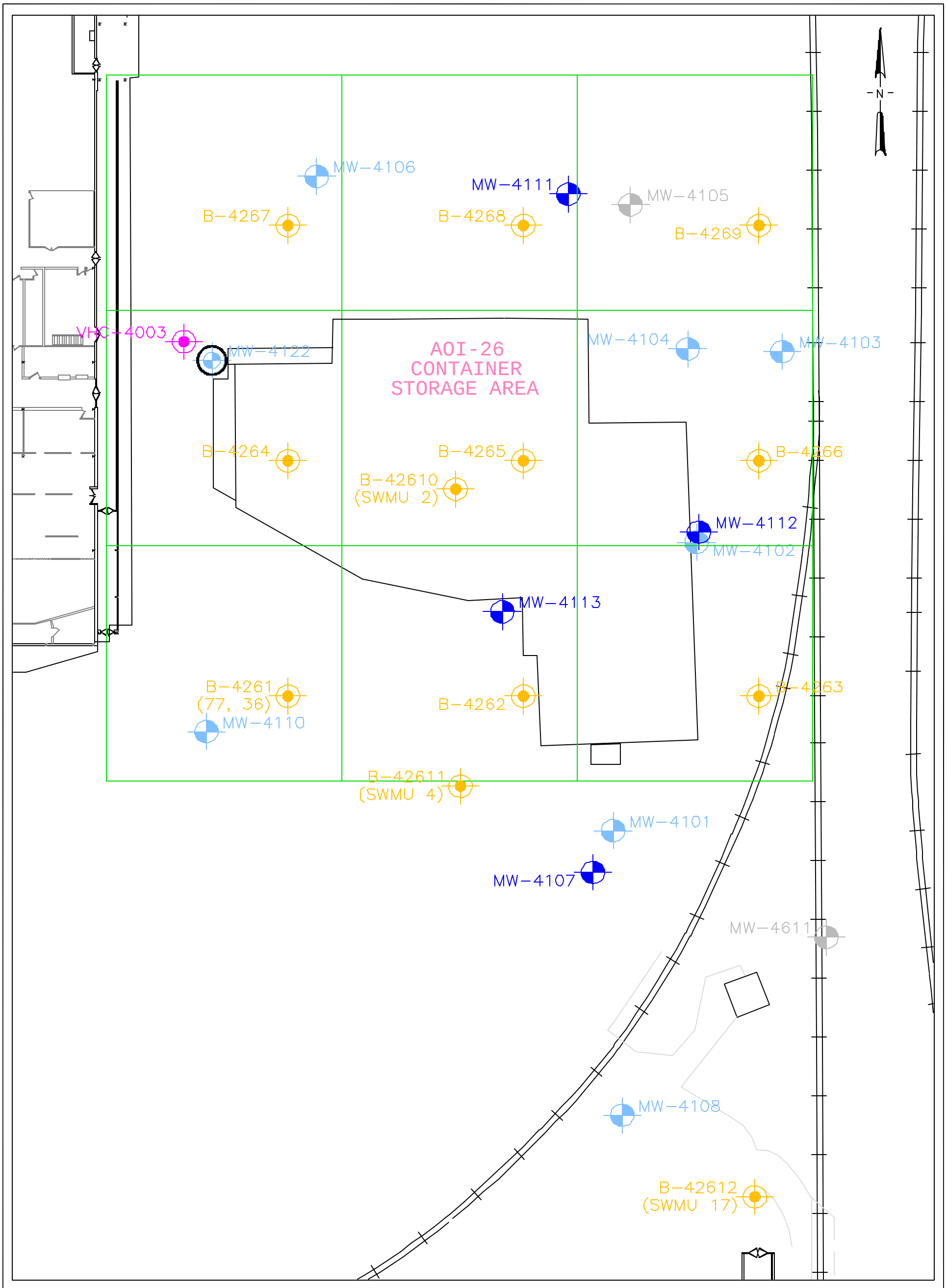
FIELD EVENT #2 SAMPLING LOCATIONS - AOI-22 CHIP COLLECTION AREA

SCALE: AS SHOWN

APRIL 2003

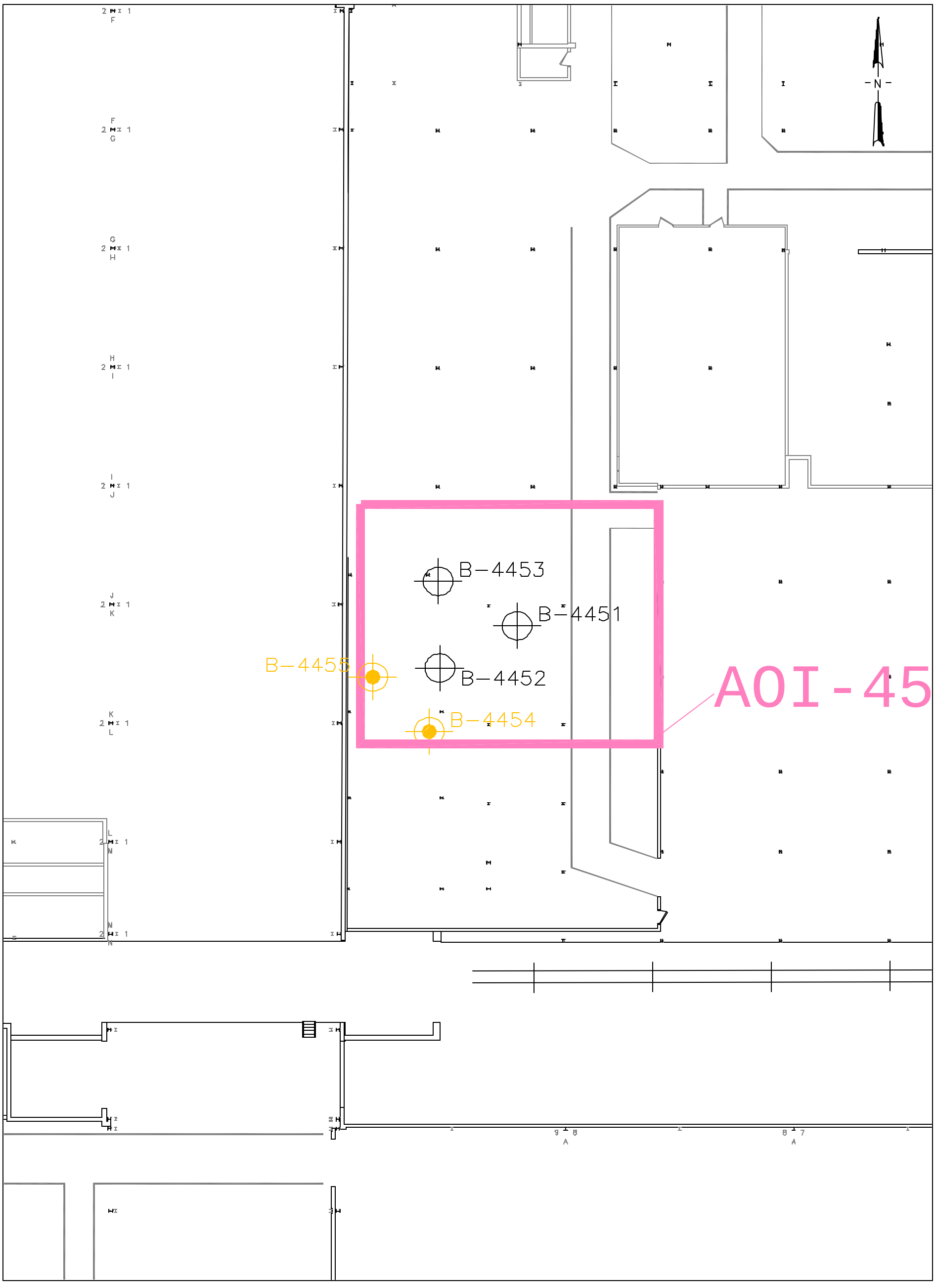
FIGURE 7

49017\017\FE2_Work_Plan\Figures\FE2_Sampling_Locations_v1.dwg



40017\017\FE2_Work_Plan\Figures\FE2_Sampling_Locations_v3.dwg

FIGURE 8



LEGEND:

- Abandoned Monitoring Well
- Existing Monitoring Well (First & Second Saturated Zone)
- Field Event #1 Boring Location
- Field Event #2 Monitoring Well (First & Second Saturated Zone)
- Field Event #2 Boring Location
- Field Event #2 Vertical Hydraulic Conductivity Sample Location

0 5 10 20 30
SCALE IN FEET

NOTES

1. Base Plan Provided by Delphi Corporation
2. Field Event #2 Locations Are Approximate. Locations May Be Modified Based On Site Features And Conditions.

UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS

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FLINT-EAST, PLANT 400, DORT HIGHWAY
FLINT, MICHIGAN

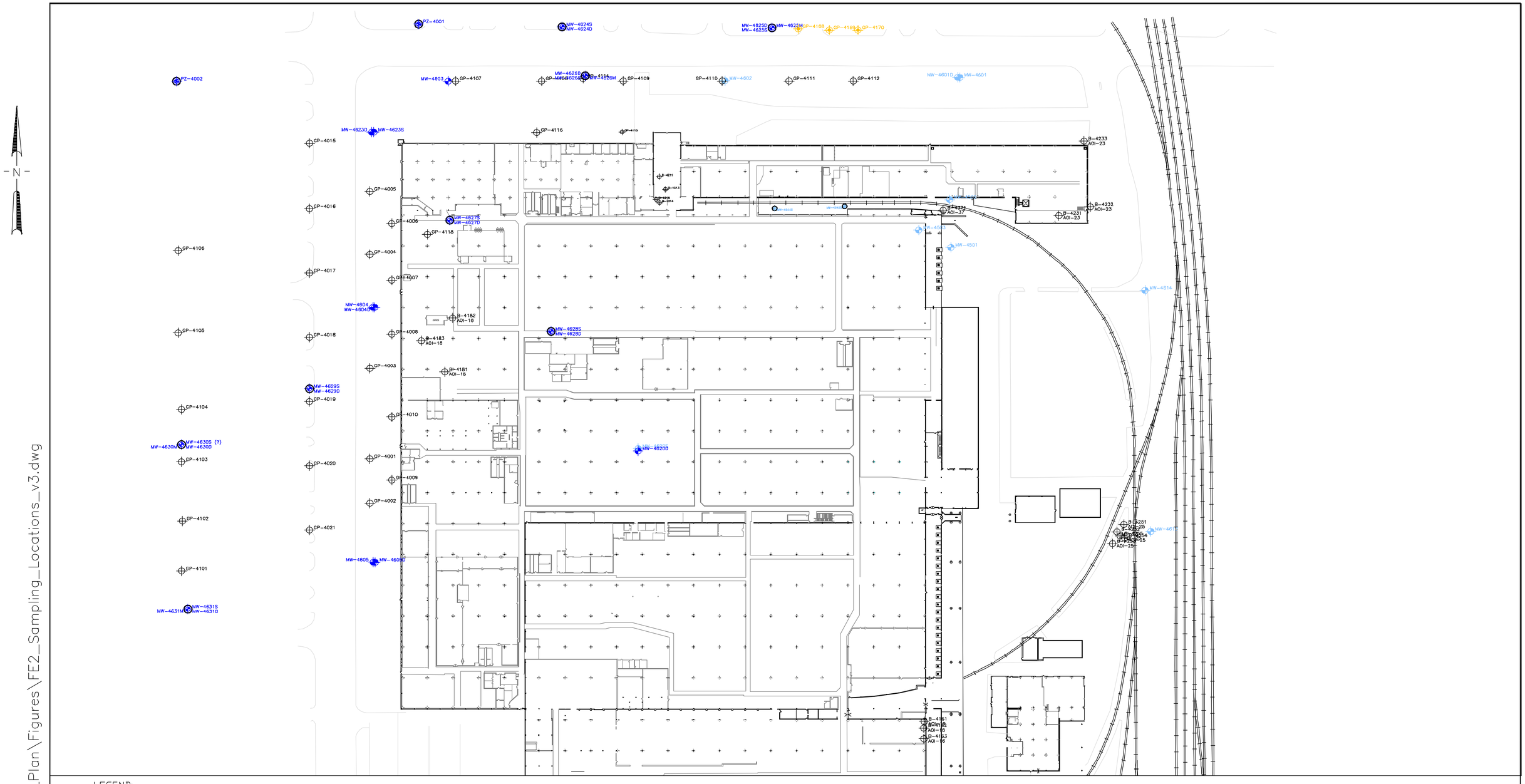
FIELD EVENT #2 SAMPLING LOCATIONS - AOI-45 COMPACTOR

SCALE: AS SHOWN

APRIL 2003

FIGURE 9

49017\017\FE2_Work_Plan\Figures\FE2_Sampling_Locations_v3.dwg



LEGEND:

- MW-4611 — Abandoned Monitoring Well
- MW-4107 — Existing Monitoring Well (First & Second Saturated Zone)
- GP-4001 — Field Event #1 Boring Location
- MW-46XX — Field Event #2 Monitoring Well (First & Second Saturated Zone)
- B-1111 — Field Event #2 Boring Location
- VHC-4001 — Field Event #2 Vertical Hydraulic Conductivity Sample Location

NOTES

1. Base Plan Provided by Delphi Corporation
2. Field Event #2 Locations Are Approximate. Locations May Be Modified Based On Site Features And Conditions.

0 25 50 75 100
SCALE IN FEET

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FLINT, MICHIGAN

FIELD EVENT #2 SAMPLING LOCATIONS – GROUNDWATER NORTHWEST

SCALE: AS SHOWN

APRIL 2003

FIGURE 10

49017\017\FE2_Work_Plan\Figures\FE2_Sampling_Locations_v3.dwg

MW-4108

B-42612
(SWMU 17)

N

MW-4119

MW-4643S

GP-4131

GP-4132

MW-4642S

MW-4117

GP-4134

GP-4133

GP-4014

MW-4118S

MW-4118D

GP-4012

MW-4610S

MW-4610D
MW-4610

GP-4024

GP-4023a

LEGEND:

- Abandoned Monitoring Well
- Existing Monitoring Well (First & Second Saturated Zone)
- Field Event #1 Boring Location
- Field Event #2 Monitoring Well (First & Second Saturated Zone)
- Field Event #2 Boring Location
- Field Event #2 Vertical Hydraulic Conductivity Sample Location

0 20 40 60 80

SCALE IN FEET

NOTES

1. Base Plan Provided by Delphi Corporation
2. Field Event #2 Locations Are Approximate. Locations May Be Modified Based On Site Features And Conditions.

UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS

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FLINT, MICHIGAN

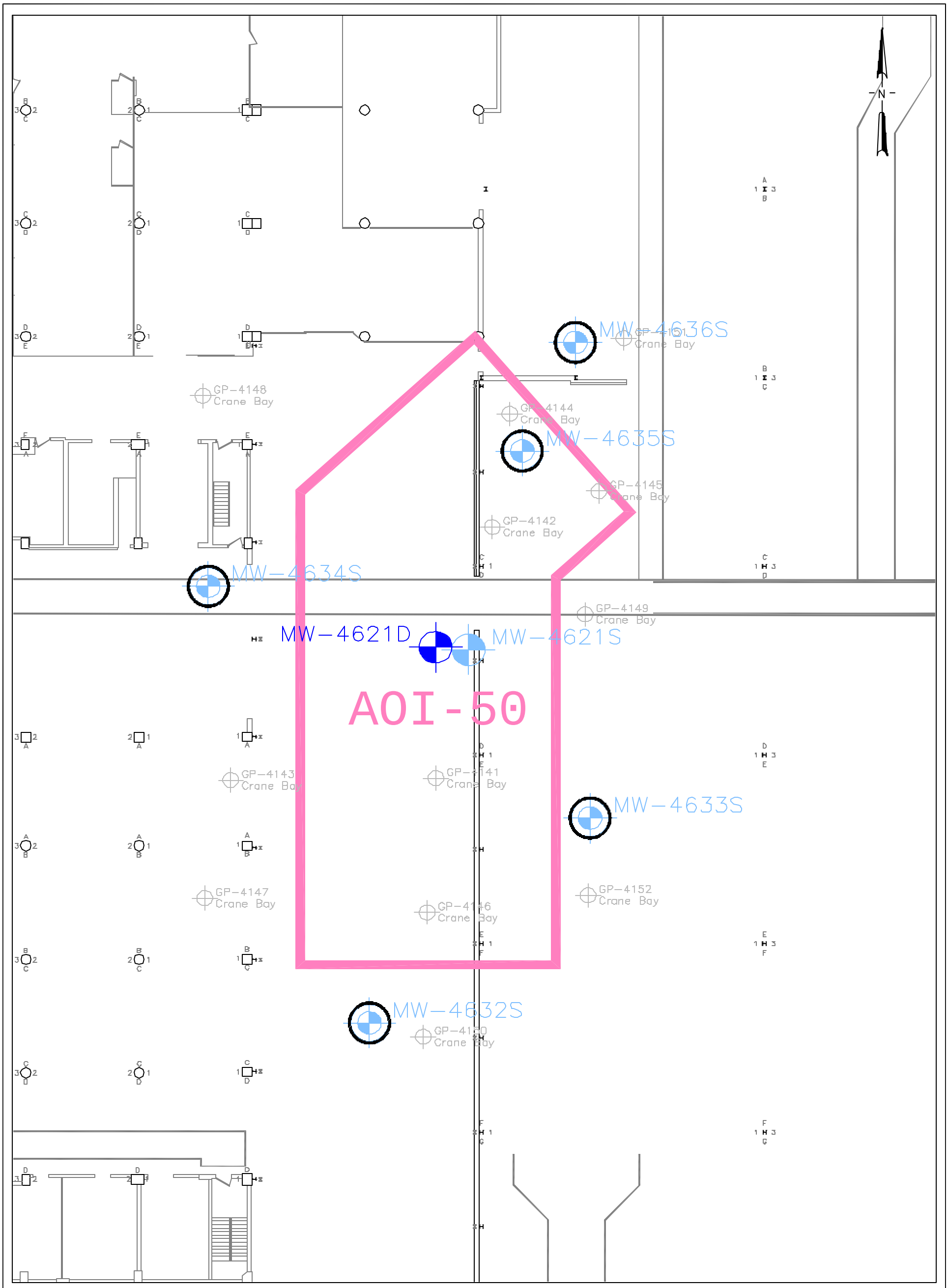
FIELD EVENT #2 SAMPLING LOCATIONS - GROUNDWATER SOUTHEAST

SCALE: AS SHOWN

APRIL 2003

49017\017\FE2_Work_Plan\Figures\FE2_Sampling_Locations_v3.dwg

FIGURE 11



LEGEND:

- Abandoned Monitoring Well
- Existing Monitoring Well (First & Second Saturated Zone)
- Field Event #1 Boring Location
- Field Event #2 Monitoring Well (First & Second Saturated Zone)
- Field Event #2 Boring Location
- Field Event #2 Vertical Hydraulic Conductivity Sample Location

0 5 10 20 30

SCALE IN FEET

NOTES

1. Base Plan Provided by Delphi Corporation
2. Field Event #2 Locations Are Approximate. Locations May Be Modified Based On Site Features And Conditions.

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FLINT, MICHIGAN

FIELD EVENT #2 SAMPLING LOCATIONS - AOI-50 CRANE BAY

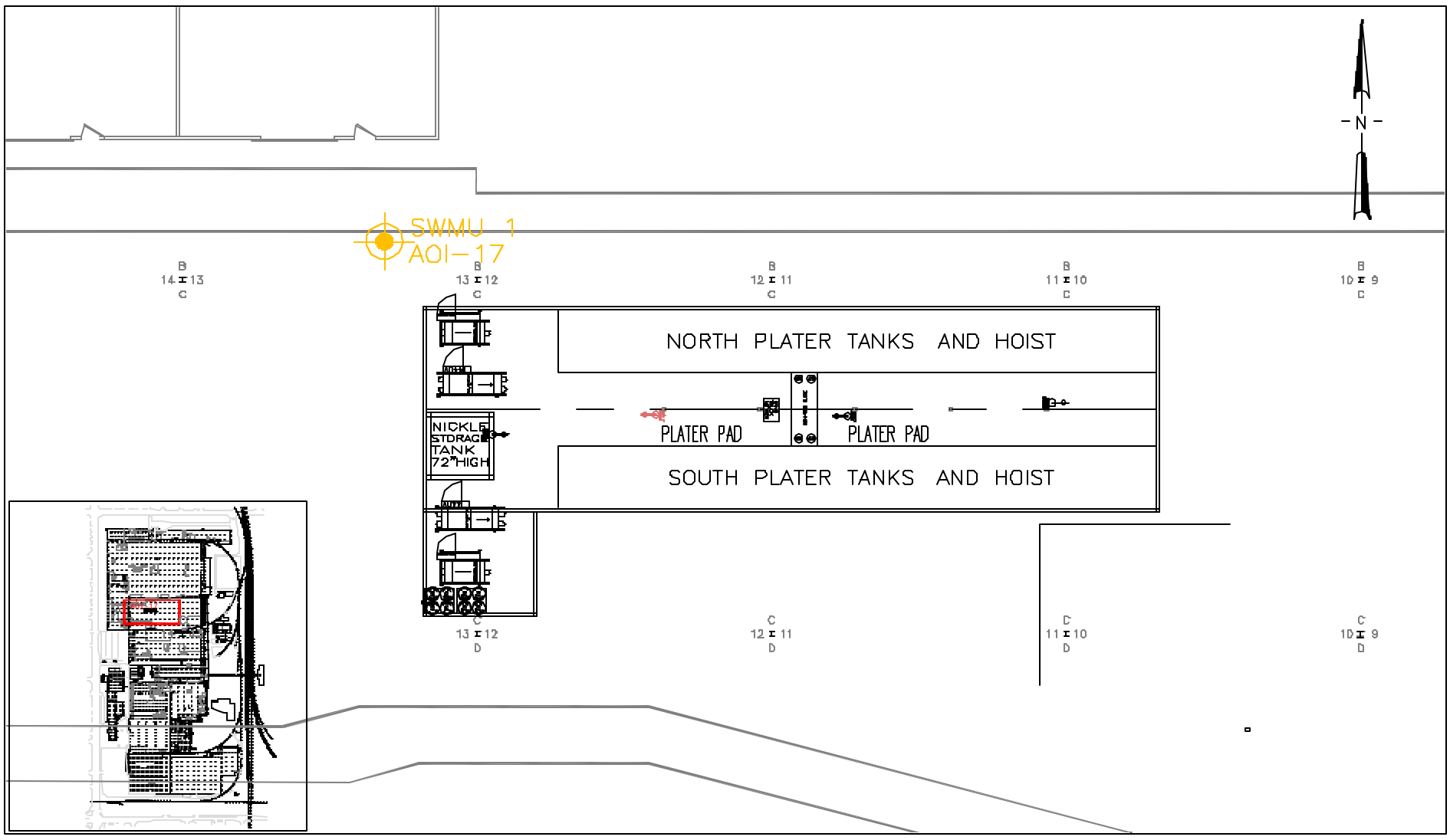
SCALE: AS SHOWN

APRIL 2003

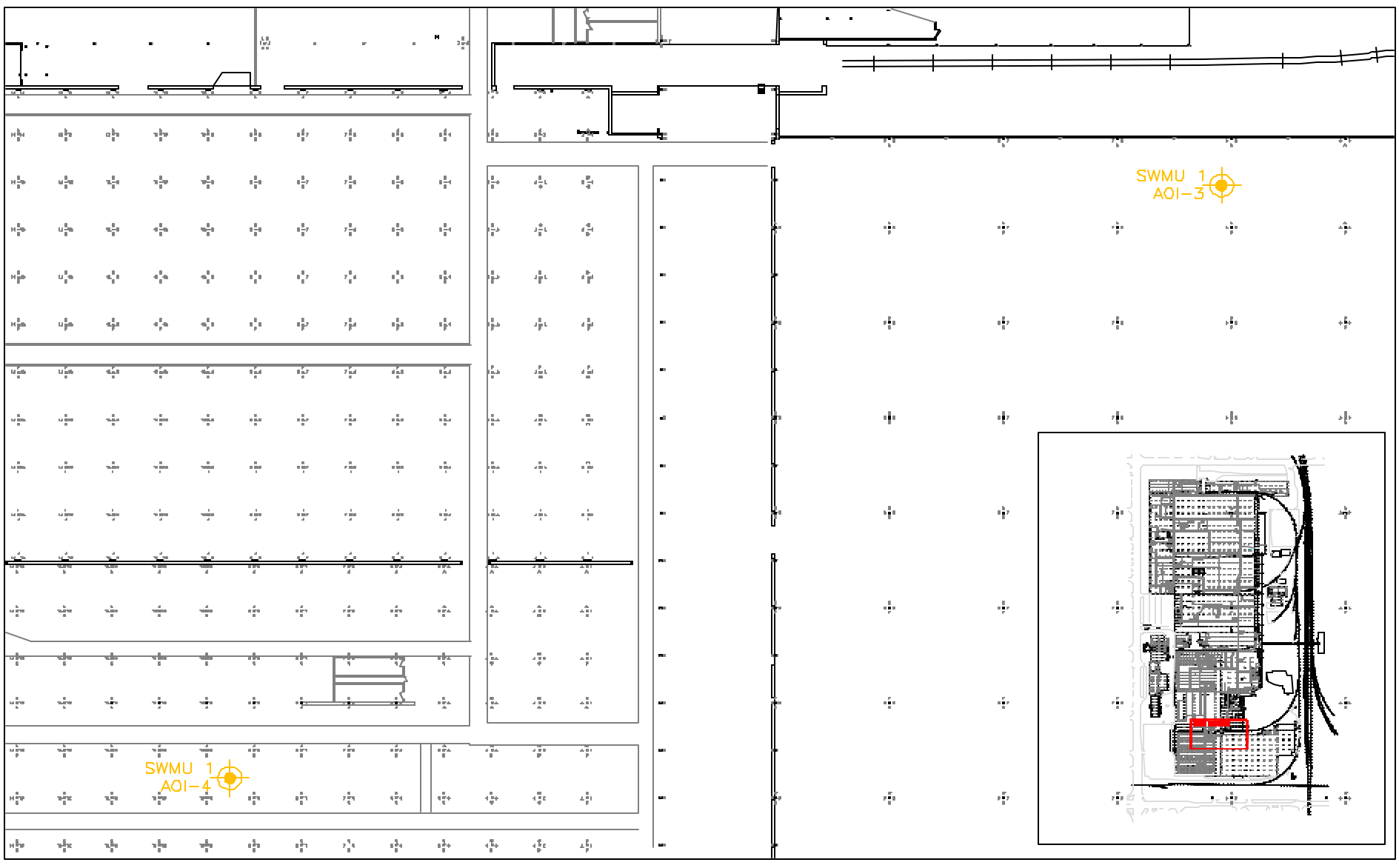
49017\017\FE2_Work_Plan\Figures\FE2_Sampling_Locations_v3.dwg

FIGURE 12

AOI-17



AOI-3 AND AOI-4



LEGEND:

- Abandoned Monitoring Well
- Existing Monitoring Well (First & Second Saturated Zone)
- Field Event #1 Boring Location
- Field Event #2 Monitoring Well (First & Second Saturated Zone)
- Field Event #2 Boring Location
- Field Event #2 Vertical Hydraulic Conductivity Sample Location

NOTES

1. Base Plan Provided by Delphi Corporation
2. Field Event #2 Locations Are Approximate. Locations May Be Modified Based On Site Features And Conditions.

DELPHI CORPORATION
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FLINT, MICHIGAN

FIELD EVENT #2 SAMPLING LOCATIONS - AOI-03 FORMER PLATING OPERATIONS, AOI-04 FORMER PLATING OPERATIONS & AOI-17 NICKEL PLATING LINE

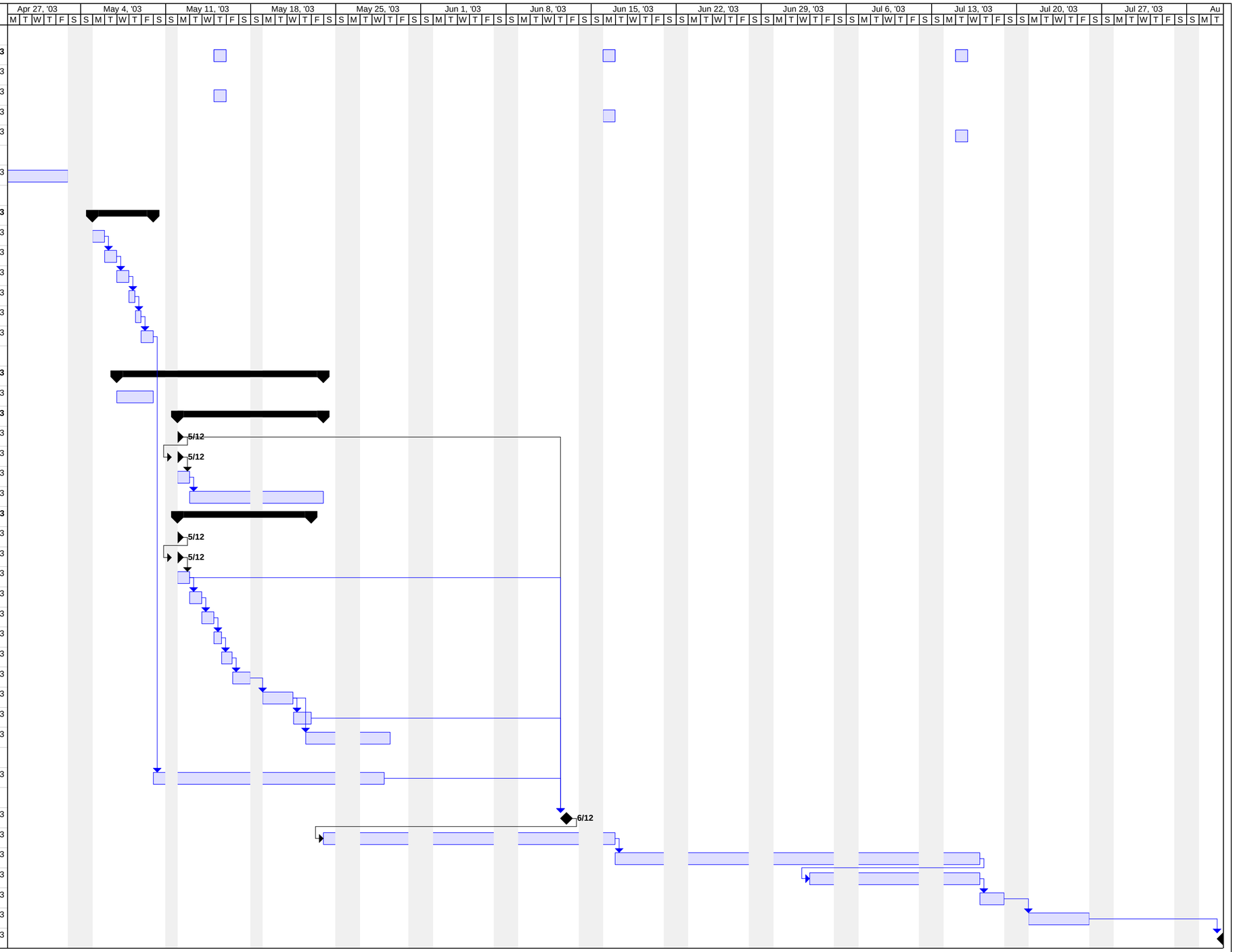
SCALE: AS SHOWN

APRIL 2003

FIGURE 13

40017\017\FE2_Work_Plan\Figures\FE2_Sampling_Locations_v3.dwg

ID	Task Name	Start	Finish
1			
2	**Monthly Groundwater Monitoring**	**Thu 4/17/03**	**Tue 7/15/03**
3	Monthly Groundwater Monitoring 1	Thu 4/17/03	Thu 4/17/03
4	Monthly Groundwater Monitoring 2	Thu 5/15/03	Thu 5/15/03
5	Monthly Groundwater Monitoring 3	Mon 6/16/03	Mon 6/16/03
6	Monthly Groundwater Monitoring 4	Tue 7/15/03	Tue 7/15/03
7			
8	Location Clearance, ROW Permits	Mon 4/28/03	Fri 5/2/03
9			
10	**Geoprobe AOI Sampling**	**Mon 5/5/03**	**Fri 5/9/03**
11	Geoprobe Sampling North of Davison Road (Task 15)	Mon 5/5/03	Mon 5/5/03
12	Task 5. AOI-08 Former Hard Chrome Plating Line	Tue 5/6/03	Tue 5/6/03
13	Task 6. AOI-09 Barrel, Rack, and U1 Plating Line	Wed 5/7/03	Wed 5/7/03
14	Task 12. AOI-35 Glass Fritter (SWMU 11)	Thu 5/8/03	Thu 5/8/03
15	Task 14. AOI-45 Compactor	Thu 5/8/03	Thu 5/8/03
16	Task 18. AOC 1 - Plating Lines (AOI-3, AOI-4, 17, & 19)	Fri 5/9/03	Fri 5/9/03
17			
18	**Monitoring Well Installation**	**Wed 5/7/03**	**Fri 5/23/03**
19	Concrete Coring	Wed 5/7/03	Fri 5/9/03
20	**Rig One**	**Mon 5/12/03**	**Fri 5/23/03**
21	Task 1. Supplemental Background Sampling	Mon 5/12/03	Mon 5/12/03
22	Task 4. Supplemental Geologic Characterization of Aquitard	Mon 5/12/03	Mon 5/12/03
23	Task 2. Supplemental Site-wide Monitoring Well Installation	Mon 5/12/03	Mon 5/12/03
24	Task 15. AOI-48 Groundwater (Northwest, Southeast)	Tue 5/13/03	Fri 5/23/03
25	**Rig Two**	**Mon 5/12/03**	**Thu 5/22/03**
26	Task 1. Supplemental Background Sampling	Mon 5/12/03	Mon 5/12/03
27	Task 4. Supplemental Geologic Characterization of Aquitard	Mon 5/12/03	Mon 5/12/03
28	Task 5. AOI-08 Former Hard Chrome Plating Line	Mon 5/12/03	Mon 5/12/03
29	Task 8. AOI-13 Gridley Area	Tue 5/13/03	Tue 5/13/03
30	Task 10. AOI-22 Chip Collection Area	Wed 5/14/03	Wed 5/14/03
31	Task 11. AOI-26 Container Storage Area	Thu 5/15/03	Thu 5/15/03
32	Task 13. AOI-40 Former Oleum UST (Tank #4023)	Thu 5/15/03	Fri 5/16/03
33	Task 16. AOI-49 Building 4082	Fri 5/16/03	Sat 5/17/03
34	Task 17. AOI-50 Crane Bay	Mon 5/19/03	Wed 5/21/03
35	Task 7. AOI-11 Executive Garage Area	Wed 5/21/03	Thu 5/22/03
36	Task 19. Monitoring Well Survey	Thu 5/22/03	Thu 5/29/03
37			
38	Groundwater Sampling	Sat 5/10/03	Wed 5/28/03
39			
40	Receipt of Last Analytical Data Package from STL	Thu 6/12/03	Thu 6/12/03
41	Database Management	Sat 5/24/03	Mon 6/16/03
42	Environ Analysis	Tue 6/17/03	Wed 7/16/03
43	Draft Data Package	Thu 7/3/03	Wed 7/16/03
44	Draft Review Meeting	Thu 7/17/03	Fri 7/18/03
45	Final Data Package to EPA	Mon 7/21/03	Fri 7/25/03
46	EPA Conference Call	Tue 8/5/03	Tue 8/5/03



Project: RFISchedule_FE2_detail
Date: Fri 4/18/03

Task | Progress | Summary | Rolled Up Split | Rolled Up Progress | Project Summary
Split | Milestone | Rolled Up Task | Rolled Up Milestone | External Tasks

FIGURE 14.
FIELD EVENT #2 PROJECT SCHEDULE
DELPHI DORT HIGHWAY
FLINT, MICHIGAN

APPENDIX A

ADDITIONAL FIELD SAMPLING PROCEDURE

3.7 PROCEDURES FOR PIEZOMETER INSTALLATION

INTRODUCTION

The term piezometer generally refers to a small-diameter observation well ordinarily installed for the primary purpose of obtaining hydraulic head (i.e.,water level measurement) data. The hydraulic information obtained from multiple piezometers allows evaluation of horizontal and vertical components of groundwater flow (flow direction and gradients). Piezometers can be installed as individual, stand-alone wells, arranged in a lateral array to monitor one hydrogeologic unit, zone, or formation. They can also be installed as clusters or nests in one location.

Piezometers are typically installed only in overburden soils due to ease of installation and potential low cost. These installations are not typically used for groundwater sampling applications or other functions, which are usually accomplished with larger-diameter monitoring wells.

PROCEDURES REFERENCED

- 3.2 Overburden Wells

PROCEDURAL GUIDELINES

Application

Piezometers utilize the same general installation protocols as for overburden monitoring wells (see Procedure 3.2 - Overburden Wells). In most instances piezometers are installed using direct-push methods (e.g., Geoprobe®), which are rapid and inexpensive subsurface exploration technologies, but piezometers can also be installed with standard drilling rig methods.

In direct-push applications a single piezometer is placed in a single direct-push borehole, typically 2 to 3 inches in diameter.

If information on the vertical component of groundwater flow is required, data from multiple hydrostratigraphic zones must be obtained. This can be accomplished using closely located clusters of piezometers installed at different vertical depths. Care must be taken to install a proper seal above the screened interval to prevent communication with hydrostratigraphic units above the target interval.

Alternatively, a "nest" of piezometers can be co-located in the same borehole. Standard (rotary) drilling rig installations are generally required for such installations, as larger-diameter boreholes are needed to accept multiple casings. The installation process is basically a repetition of overburden well installation procedures on a vertical, "one-atop-the-other" basis, with proper seals in between target intervals.

Materials

Piezometers are usually smaller diameter than monitoring wells, typically 1.0 inch or 1 ¼ inch inside diameter (ID). Well screen and riser should be Schedule 40 PVC. Well screen should be 0.010 inch factory-slotted (piezometers are not typically continuous wrap due to cost limitations) and screen segments should be a maximum 5 feet long. As with overburden wells, the well screen and riser should be O-ring-sealed, flush-threaded, PVC. No glues or solvents should be used to assemble the well casing.

Installation

Piezometer installations, due to their potential low cost, most often accompany direct-push explorations. In small-diameter applications such as direct-push technology, a single piezometer is usually placed within a single direct-push borehole. The piezometer installation is carried out similarly to that for overburden wells (Procedure 3.2 - Overburden Wells), upon completion of the borehole to depth:

- Install the direct-push borehole, typically about 2 to 3 inches in diameter.
- Install screen and riser sections as discussed above, to the target depth.
- Place sand pack material of Morie or U.S. Silica #1, #0, or #00N, or equivalent, to 1 to 2 feet above the top of the screen section.
- Place granulated bentonite to form a 1- to 2-foot thick seal above the sand pack (chips or pelletized bentonite can be used but may not fit down the annulus between the piezometer and the borehole). Hydrate the bentonite if sufficient groundwater is not present in the borehole.
- Place clean backfill soil, additional bentonite, or grout if desired, to create final seal around the riser to ground surface. If soil is used to backfill, install a surface seal of bentonite or grout.

Installation of nested piezometers should adhere to the following procedures:

- Completion of 6-inch to 10-inch (4 ¼ inch to 6 ¼ inch ID hollow-stem augers or casing) borehole to depth for two or three piezometers. The actual borehole diameter should be based on the number of piezometers to be installed in the borehole, anticipated soil materials, etc. The inside diameter of the temporary casing or auger must allow sufficient space to install sand pack and seal materials without bridging.

- Use well screens of 5 feet length or less.
- Install the deepest piezometer to the base of the borehole, or to the target depth. (Note: if the bottom depth of the exploration and the bottom depth of the deepest piezometer vary by more than 1 foot this interval will be plugged using either grout or bentonite seal.)
- Place sand pack around the deepest piezometer screen to 1 to 2 feet above the top of the screen.
- Install a minimum 1-foot thick bentonite seal on top of the sand pack (hydrate if necessary based on water level measurements obtained).
- If the next piezometer is to be installed immediately above the first, place 6 inches of sand on top of the bentonite seal before placing the next screen.
- Install the next-deepest piezometer to the desired depth.
- Place similar seals around the second piezometer.
- Continue the above procedures for each multi-level piezometer installed.
- Piezometer installation and seal placement should be performed as the augers or casing is withdrawn from the borehole. Do not install piezometers in an uncased hole, as this presents the possibility of caving and mixture of formation material with sandpack and seal materials, which will compromise the quality of the installation and therefore the data obtained.
- Label each individual piezometer casings appropriately to prevent confusion regarding depth intervals measured.

Concrete surface seals and protective casing installations are also recommended but may be considered optional, depending on factors such as piezometer location, cost considerations, degree of permanence, etc. If installed it is recommended that concrete surface completions be placed to a depth of at least 18 inches below ground surface.

EQUIPMENT/MATERIALS

- Direct-push or standard drilling rig apparatus and equipment.
- Well screen and riser materials.
- Well sand pack and seal materials.
- Surface seal and protective casing materials, if necessary.

REFERENCES

Driscoll, Fletcher G., Groundwater and Wells, Johnson Filtration Systems, Inc., 1986.

Freeze, R. Allen, and Cherry, John A., Groundwater, Prentice-Hall, 1979.